WIIK'S DOUBLE LINE REANALYSED Sz. Bérczi[1] & B. Lukács[2], [1] Eötvös University, Dept. of Petrology and Geochemistry & Dean's Office, H-1088 Budapest, Rákóczi út 5. Hungary, [2] Central Research Institute for Physics, RMKI, Bp. 114. Pf. 49. H-1525 Budapest, Hungary

Remembering the noticable result of Wiik [1] on the two lines of constant total Fe content for chondrites we carried out statistical calculations on the more than 400 chemical compositional data of the chondrites of the new Catalog of Antarctic Meteorites [2]. We have got back Wiik's 2 fundamental groups for Fe content, on a statistics 14 times larger than Wiik's one and with a full statistical analysis. One group is peaked around Fe/Si≡x~1.694 ("High group"), the other around Fe/Si≡x~1.215 ("Low group"). The first contains almost solely C, H and E chondrites, the second L and LL ones. Mg/Si content also has been investigated; there is a strong central peak for H, L and LL with two small side peaks for C and E.

Introduction: Some four decades ago Wiik [1] performed a statistical analysis on a homogeneous sample of 30 chondrites for Fe content. On the ox. Fe vs. nonox. Fe plane he got 2 parallel diagonal strips, one with cca. 27 weight %, the another with cca. 21 % (normalised to volatile-free basis). (Earlier the two lines had been conjectured by Urey and Craig [3], however from a sample not so homogeneous, and not on volatile-free basis.) Since the existence of 2 and only 2 such lines (of constant total Fe) imposes very serious constraints on theories of the origin of chondrites, we repeated the analysis on the largest possible homogeneous sample: the 1995 NIPR dataset for bulk compositions of chondrites, all measured by the same group and with the same method [2]. The dataset contains 403 chondrites but represents 2987 ones.

Method: We analysed the distributions for Fe/Si and Mg/Si, which two quantities are conserved during chondrite evolution (at least until the melting point of Fe). Chondrites were selected in NIPR after identification for type and petrologic class. So in a van Schmus-Wood box the selection was more or less random. Therefore the distributions for Fe/Si and Mg/Si can be projected to the whole field of 2987 chondrites. We calculated averages <> with statistical errors and mean deviations Í both for Fe/Si (x) and for Mg/Si (y). Although the distributions are calculated for the whole field, the statistical errors are calculated, of course, only from the number of analysed chondrites [4].

The numbers of identified vs. analysed NIPR chondrites arranged into a van Schmus-Wood diagram are given in Table 1:

Table 1: NIPR chondrites

T\PC	1	2	3	3-4	4	4-5	5	5-6	6	6-7	7
E	ø	ø	17/5	ø	7/2	ø	-	ø	-	ø	-
H	ø	ø	65/12	7/4	779/72	21/9	528/46	8/2	316/23	ø	-
L	ø	ø	109/21	-	142/28	-	91/1	9/3	621/94	2/1	-
LL	ø	ø	23/10	-	23/9	-	19/10	-	78/18	-	3/2
C	3/1	77/17	33/10	ø	3/2	ø	-	ø	3/1	ø	ø

Legend: T\PC: Type and van Schmus-Wood petrologic class; ø: Combination not yet known; -: Combination absent in the NIPR analysis; a/b: N_i/n_i (Identified/analysed).

Results: Results are shown in Table 2 as follows:

Table 2: Averages and mean deviations for chondrite type

E	$\langle x \rangle = 1.846 \pm 0.048$ $\sigma_x = 0.125$ $n = 7$	$\langle y \rangle = 0.693 \pm 0.0050$	$\sigma_y = 0.013$
H	$\langle x \rangle = 1.693 \pm 0.0099$ $\sigma_x = 0.130$ $n = 169$	$\langle y \rangle = 0.865 \pm 0.0016$	$\sigma_y = 0.021$
C	$\langle x \rangle = 1.638 \pm 0.015$ $\sigma_x = 0.085$ $n = 31$	$\langle y \rangle = 0.937 \pm 0.0085$	$\sigma_y = 0.047$
L	$\langle x \rangle = 1.240 \pm 0.0080$ $\sigma_x = 0.103$ $n = 164$	$\langle y \rangle = 0.841 \pm 0.0015$	$\sigma_y = 0.019$
LL	$\langle x \rangle = 1.128 \pm 0.022$ $\sigma_x = 0.152$ $n = 49$	$\langle y \rangle = 0.839 \pm 0.0052$	$\sigma_y = 0.036$

The *total* distribution for Mg/Si is single-peaked with

Table 3

Total	$\langle y \rangle = 0.857 \pm 0.0016$
	$\sigma_y = 0.034$

however two side peaks, one for E, another for C are clearly separated on high significance level (cf. Table 2), but they are extremely small. H, L and LL merge indistinguishably.

For Fe/Si the distribution is double-peaked as

Table 4

$N_1 \approx 1105$, $n_1 \approx 213$
$\langle x \rangle_1 \approx 1.215 \pm 0.0066$,
$\sigma_{1x} \approx 0.096$
$N_2 \approx 1882$, $n_2 \approx 207$
$\langle x \rangle_2 \approx 1.694 \pm 0.0084$,
$\sigma_0 \approx 0.123$

The two distributions do not overlap at 2σ, so they (not only the peaks) are well separated at more than 95% significance level. As expected since Wiik, the "high" group contains almost exclusively C, H and E, the "low" one L and LL.

We note that the newly identified R type chondrites seem to be located in between the two peaks, the average of the 3 chondrites analysed in [5] is 1.47, almost at the meeting point of the distribution curves of the {C,H,E} and {LL,L} groups.

References: [1] Wiik, H. B. (1956) *GCA 9*, 279-289; [2] Yanai, K., Kojima, H., Haramura, H. (1995) *Catalog of the Antarctic Meteorites*, NIPR, Tokyo; [3] Urey, H. C., and Craig, H. (1953) *GCA* ***4***. 36; [4] Jánossy L.: *Theory and Practice of Evaluation of Measurements*, Oxford University Press, Oxford, 1965; [5] Palme H., Weckwerth G. & Wolf D. 1996 *LPS* ***XXVII*** 991.